

Drilling deeper through a vertical feature won't work.



BJ Bonin

Geologist

284 Macalester Street
St. Paul, MN 55105
(651) 307-6875
bjbonin1@yahoo.com

Wells Mining Mapping
Exploration for water and minerals



Minnesota Professional Geoscientist #47845
Arizona Professional Geologist #53589
Wisconsin Professional Geologist #1374-13

November 15, 2018 MGWA Conference
Photo: MN DNR

Split Rock Lighthouse State Park

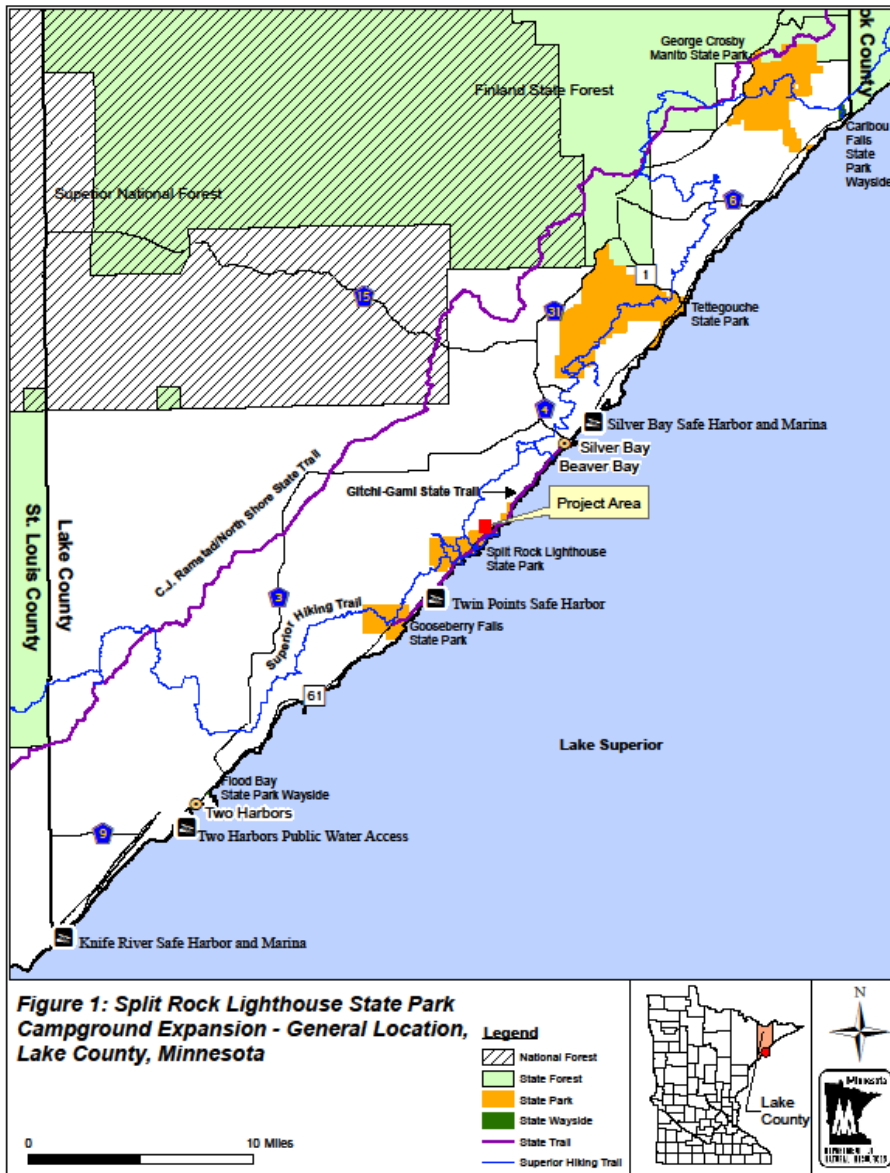


Figure 1: Split Rock Lighthouse State Park Campground Expansion - General Location, Lake County, Minnesota

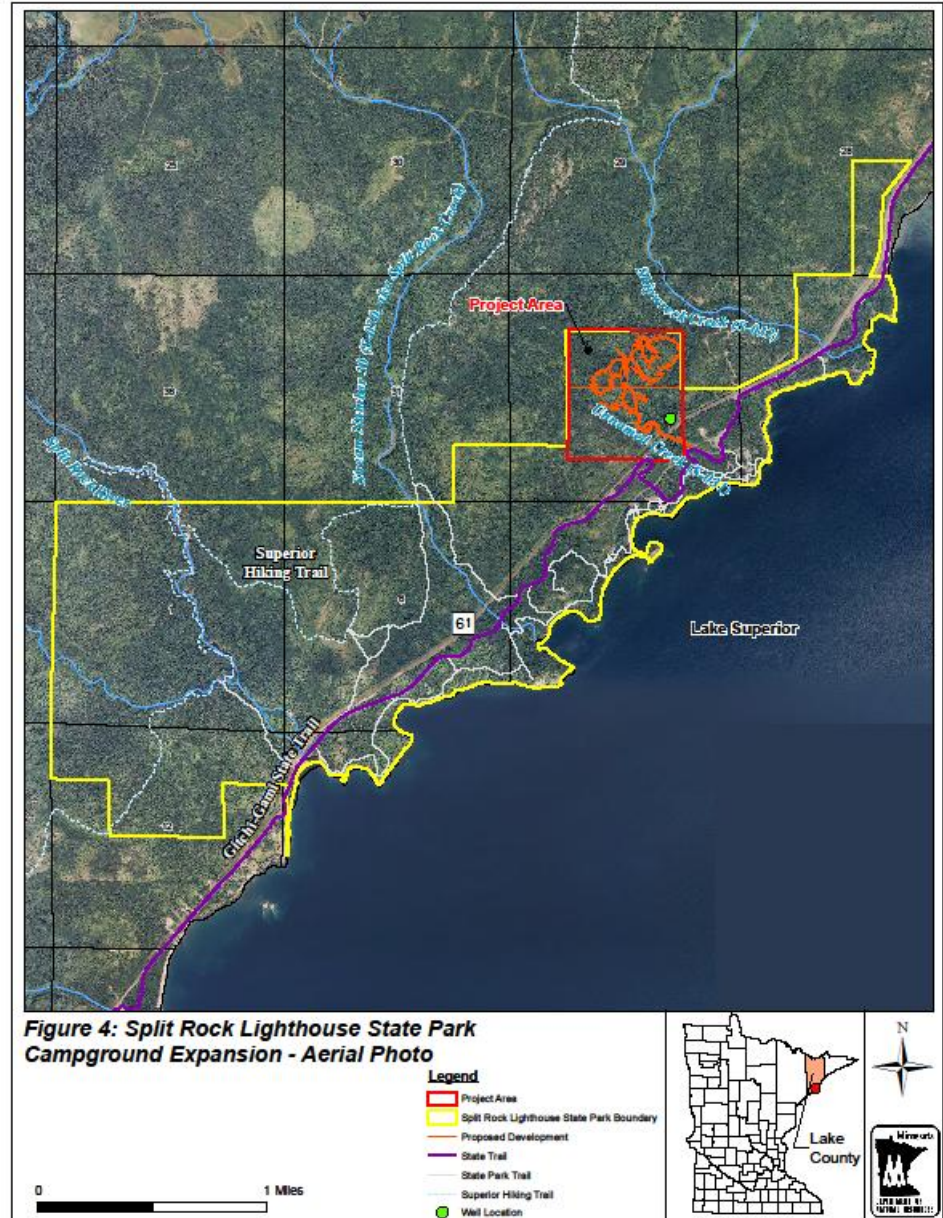
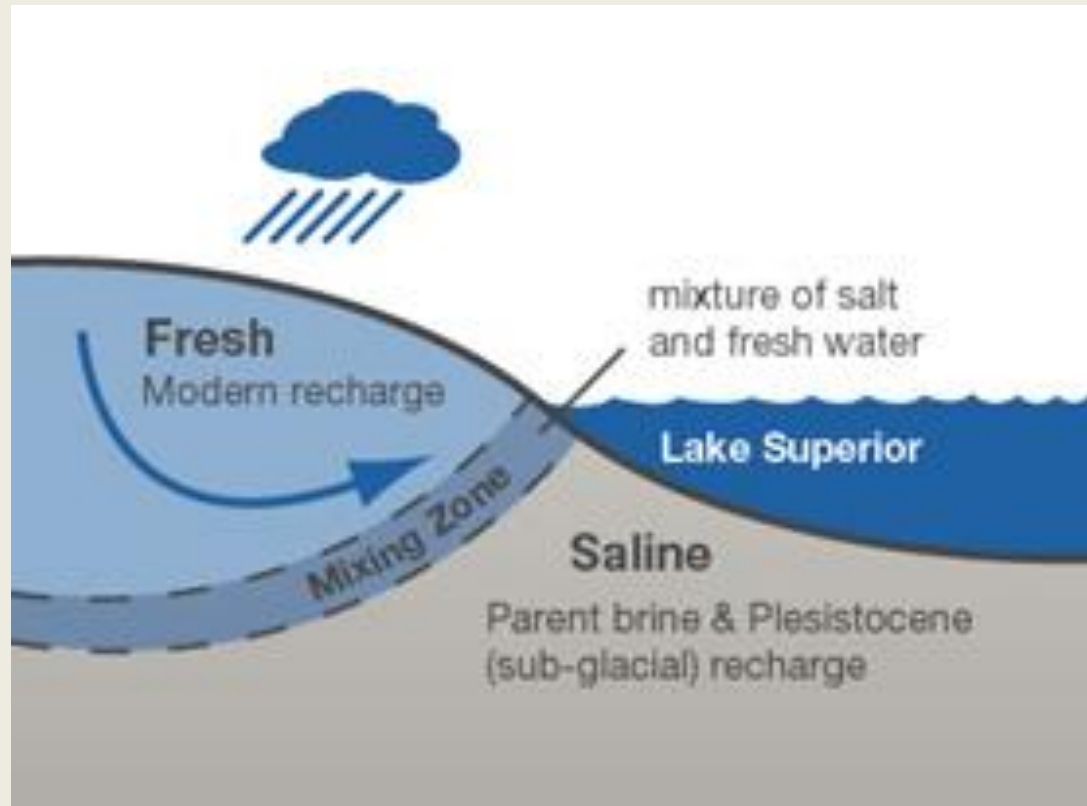


Figure 4: Split Rock Lighthouse State Park Campground Expansion - Aerial Photo

Water Supply

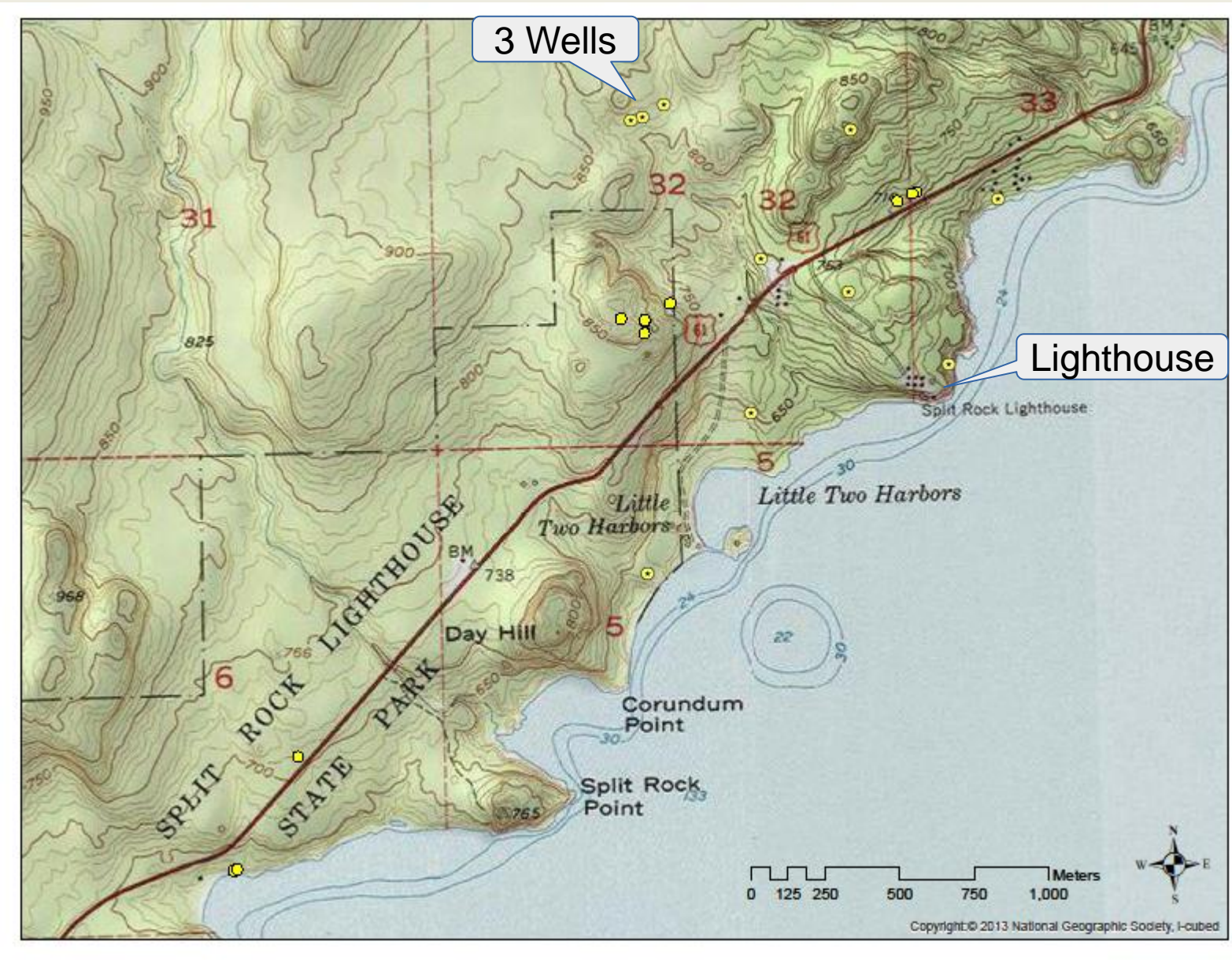
- Lake?
- A well is more than “just a hole in the ground”.
- Failure does not mean incompetence.
- Fractured crystalline rock, thin sediment cover
- Location of wells vs. contamination (drainfields!)
- Looking for 10-20 gpm, which is a lot of water for this area!
- Salt water

Wait – did you say “Salt Water”?

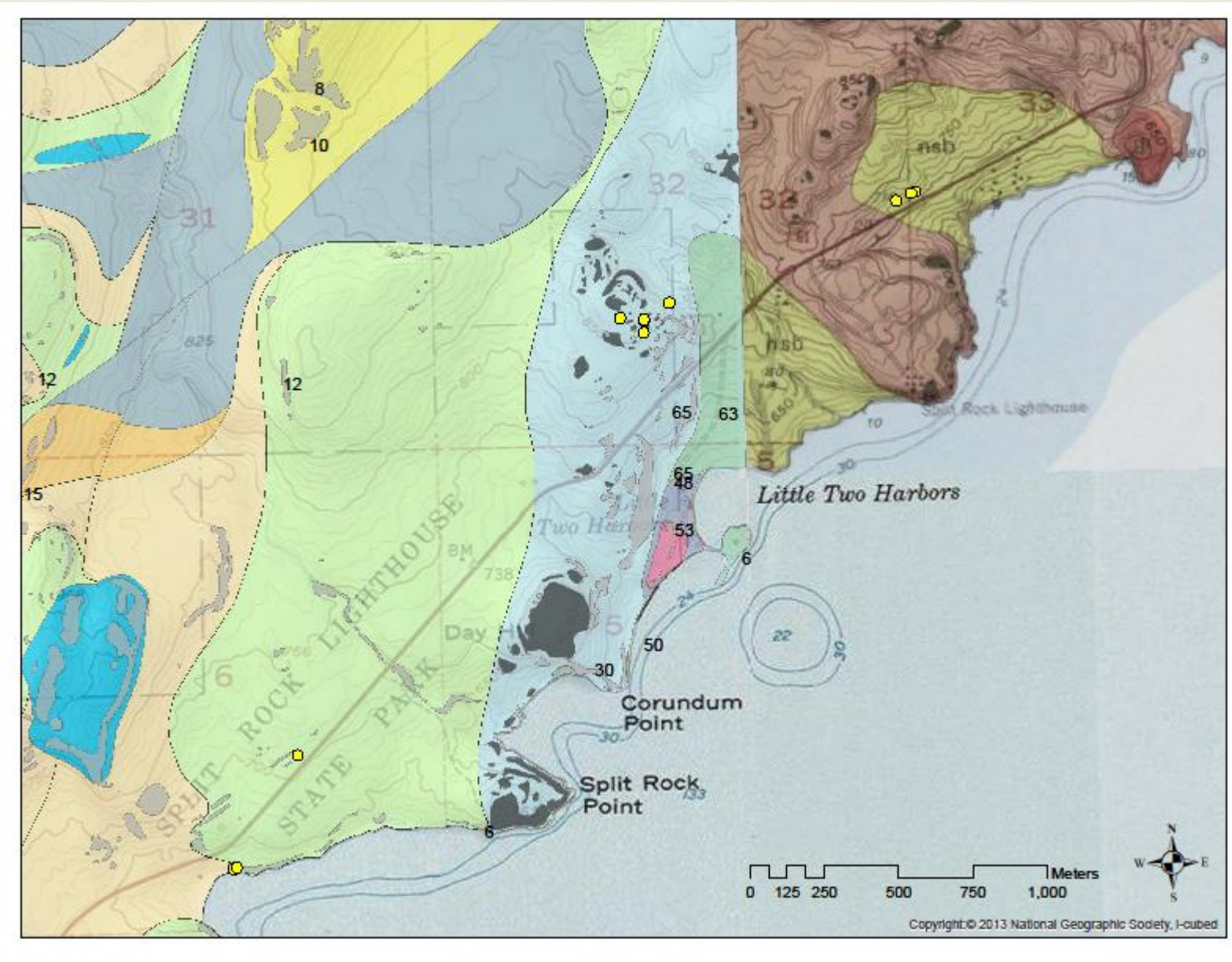


From Sea Grant

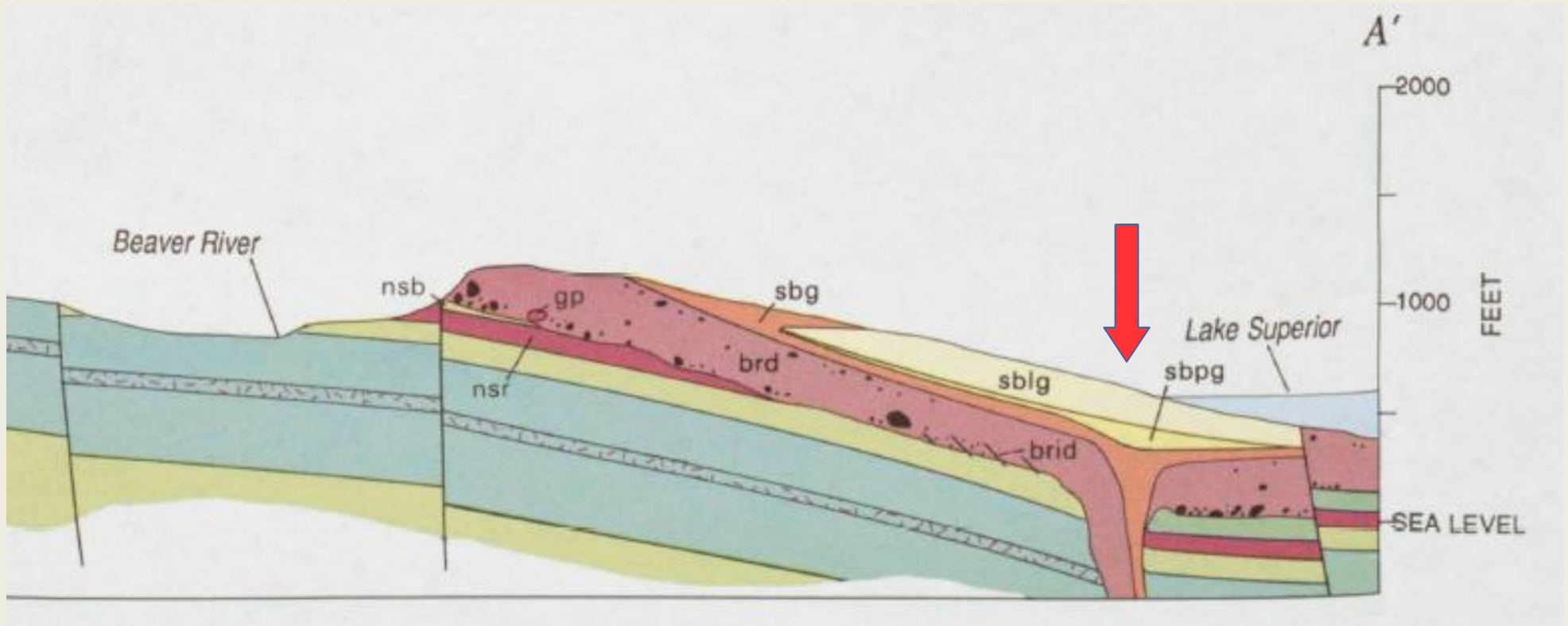
Site – Topo Map



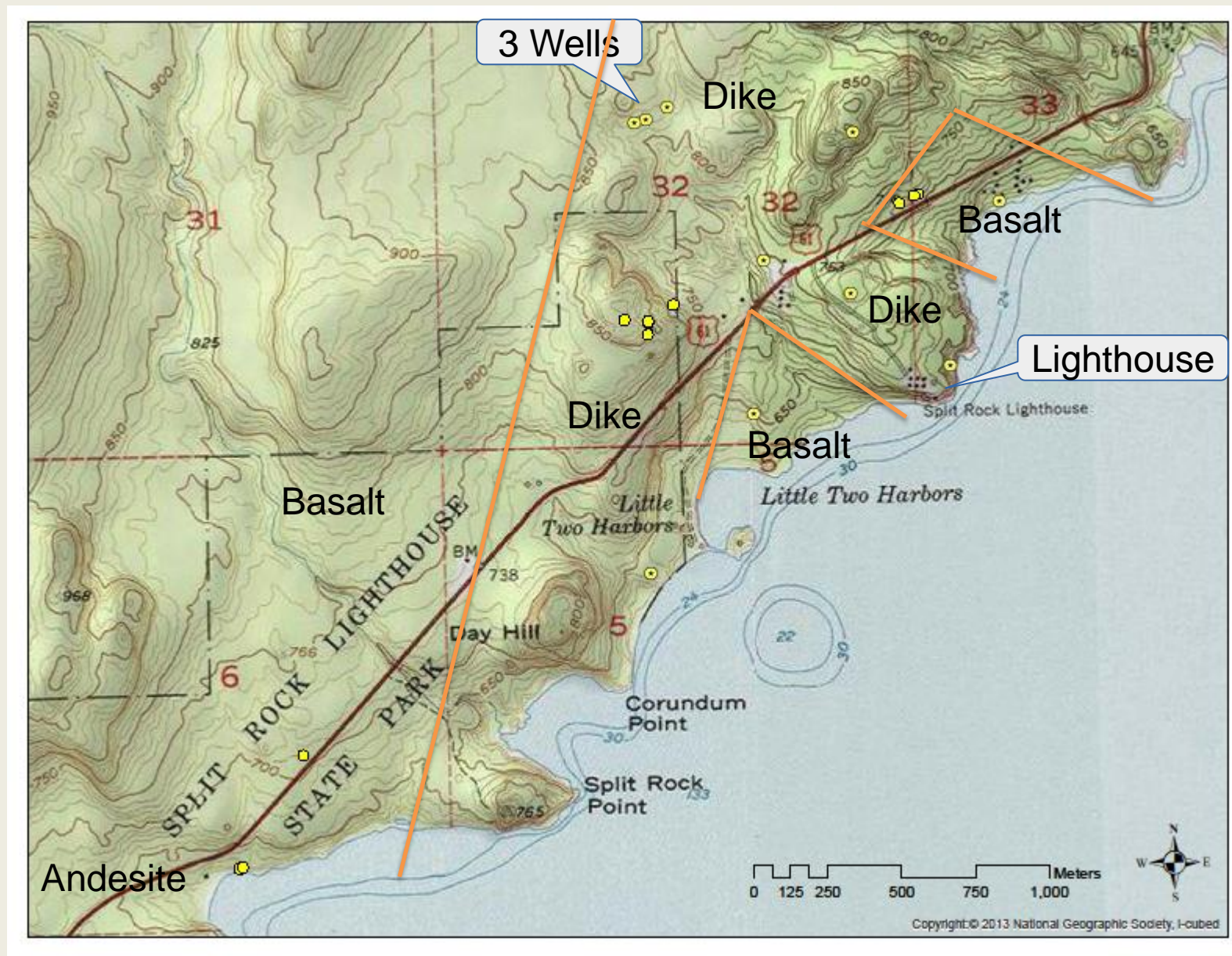
Geologic Map



Geological Cross Section



Site – Topo shows general geology



Best Source - gravels

- Dirty gravel at bottom of Ophitic basalt dip slopes
- Limited reservoir
- Recharge!
- Scarce in area around park







Next best source – Horizontal Rock

- Basalt flows
 - Fractured, with visible fractures 100+ meters long
 - Hard to predict
 - Difficult to identify during construction
 - Infiltration through fractures
- Contacts between lava flows
 - Some large, distinct flows have been mapped.
 - The contacts between these flows can probably be predicted
 - Fracture webs at contacts
 - Attentive driller can locate during construction
- Fracture networks can convey small volumes of water through these rocks horizontally and vertically







Last Resort – Vertical Rock

- Excuse the pun
- Makes up the high ground – resistant rock
- Diabase and Anorthosite
- Crystalline rock, with crystals up to 3” size found on site
- Diabase is fractured, Anorthosite is not
- Fractures are small scale (< 1m) and vertical

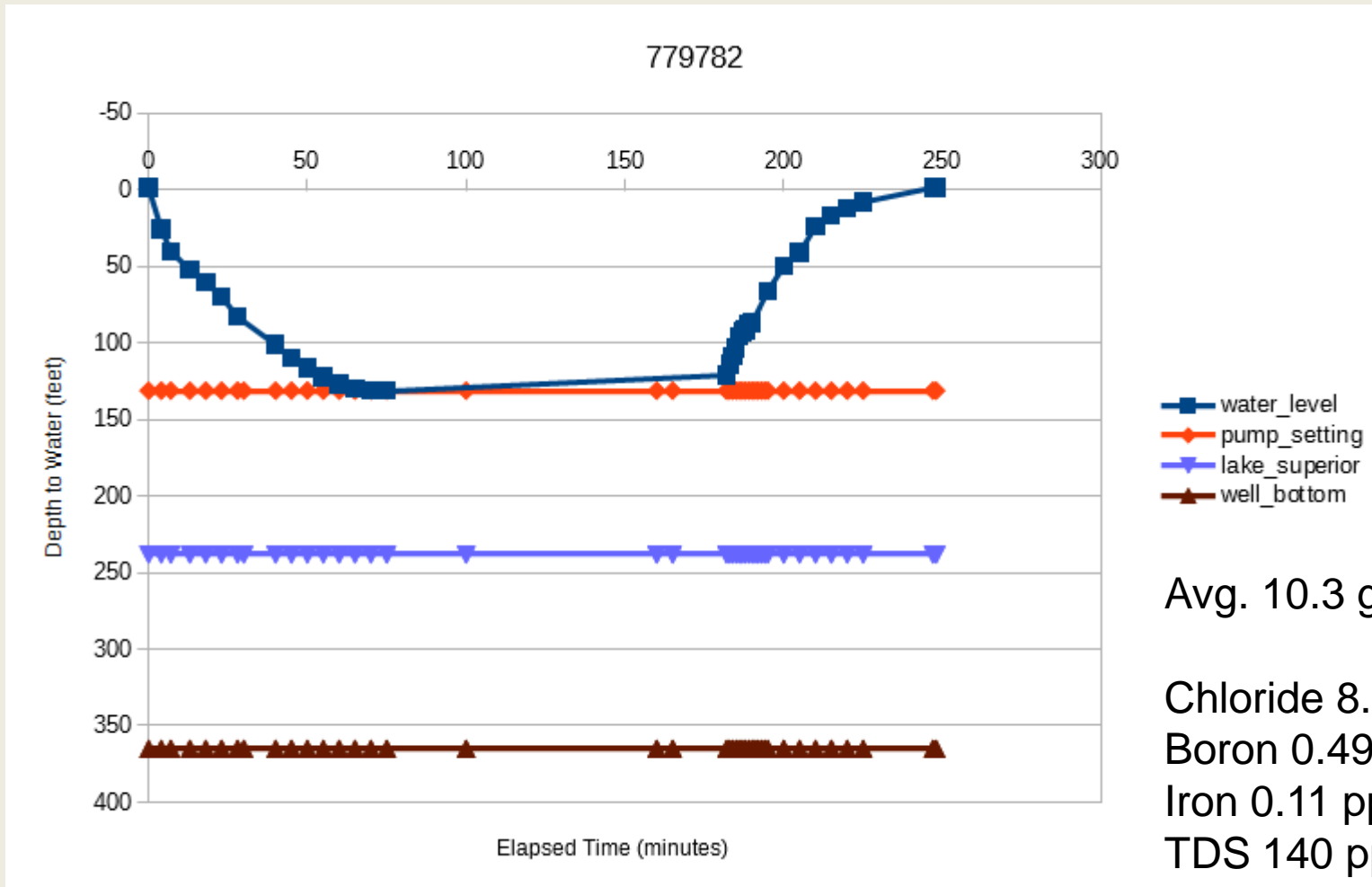








Well 1 (Unique No. 779782)



Avg. 10.3 gpm

Chloride 8.7 ppm

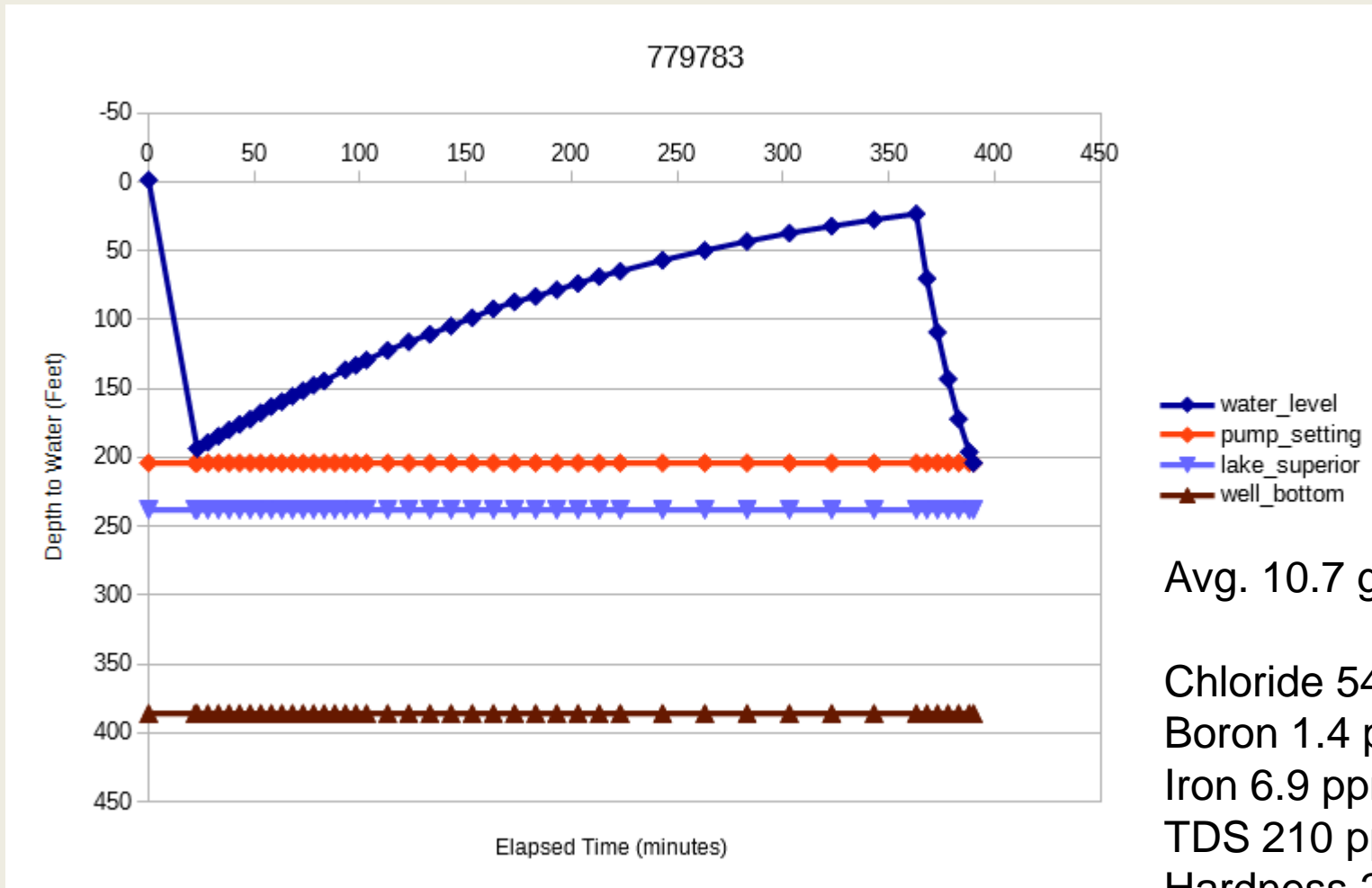
Boron 0.49 ppm

Iron 0.11 ppm

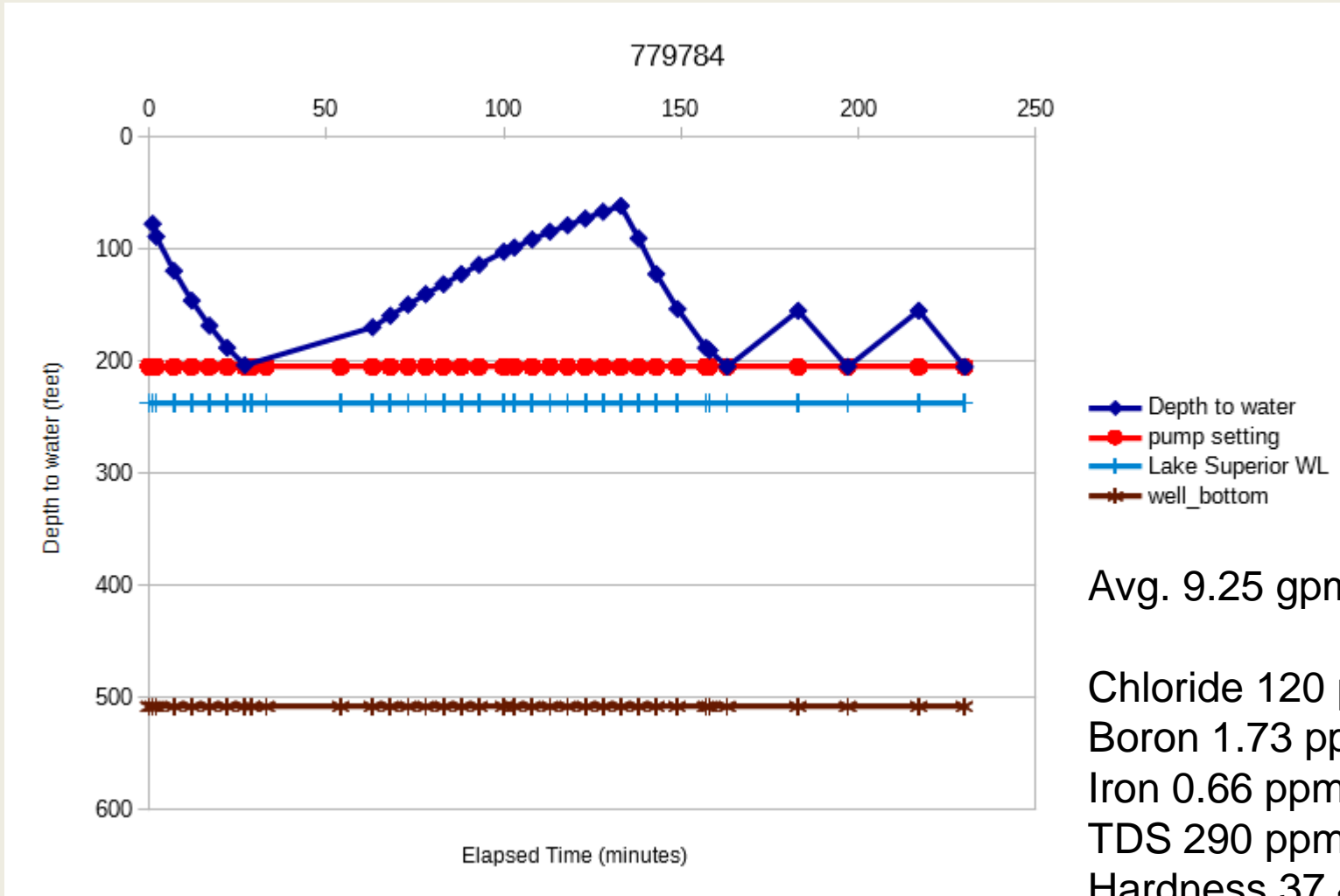
TDS 140 ppm

Hardness 12.4 ppm

Well 2 (Unique No. 779783)

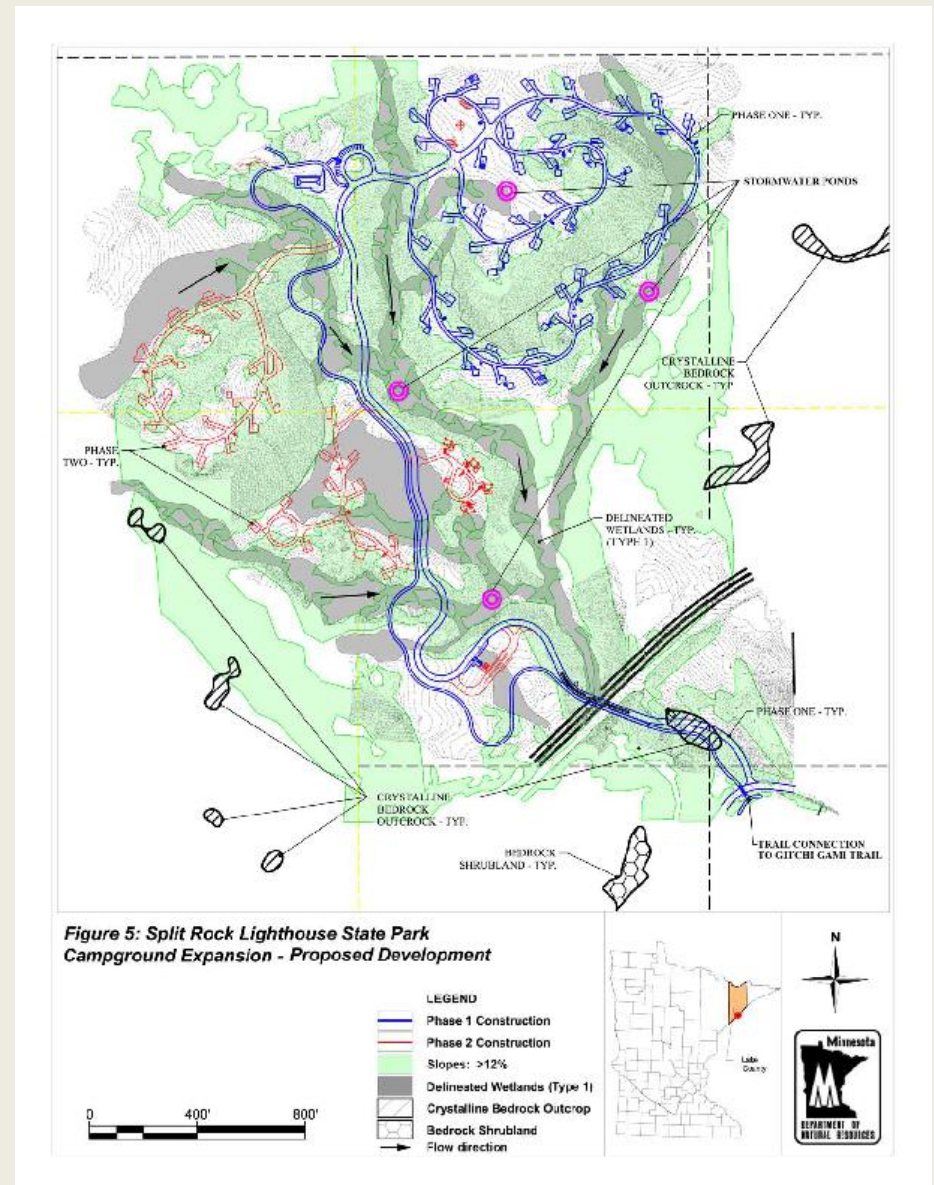


Well 3 (Unique No. 779784)



Campground?

- On hold, but recently resurrected
- Wells sited for distribution, not for best or sustainable supply
- Large tanks with multiple small wells + booster pumps are common in area
- Concern about contaminants, especially natural ones



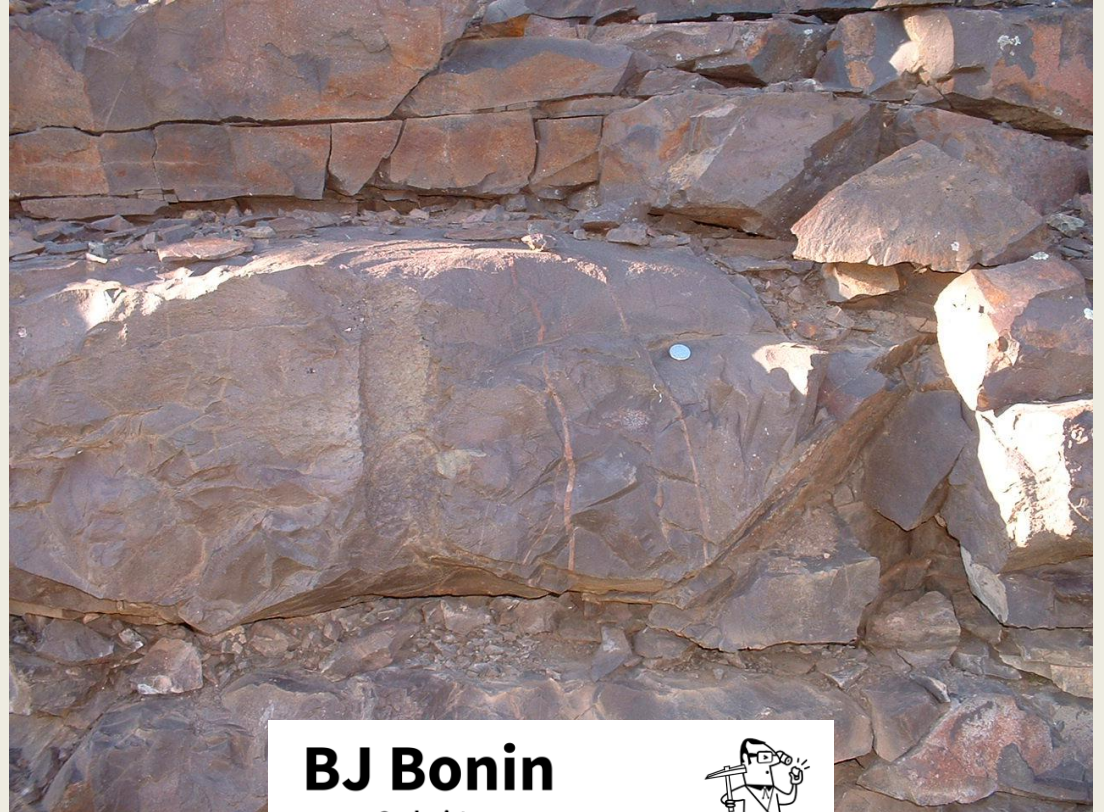
Takeaway for water supply planning

- Hazards of cookie cutter approach
- Tailor the project to the site
 - Understand pros and cons
- Test first, acquire property second
 - The best way to find something is to look

Questions

Thanks to

- DNR
- McKeever Well
- MGS and Bruce
- Rasmussen Well
- WSB
- Sea Grant



BJ Bonin

Geologist

284 Macalester Street
St. Paul, MN 55105
(651) 307-6875
bjbonin1@yahoo.com

Wells Mining Mapping
Exploration for water and minerals



Minnesota Professional Geoscientist #47845
Arizona Professional Geologist #53589
Wisconsin Professional Geologist #1374-13